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Numbers and Lengths, by Season, of Fishes Caught with an Otter Trawl near Woods Hole, Massachusetts, September 1961 to December 1962

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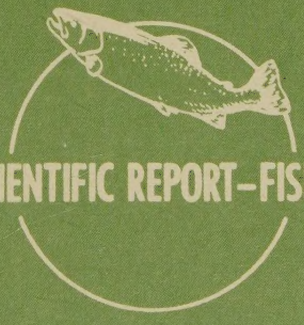

SPECIAL SCIENTIFIC REPORT–FISHERIES No. 622

NOTE

Until October 2, 1970, the National Marine Fisheries Service, Department of Commerce, was the Bureau of Commercial Fisheries, Department of the Interior. Throughout the body of this report, which was prepared for printing before October 2, the older term is used.

UNITED STATES DEPARTMENT OF COMMERCE
Maurice H. Stans, *Secretary*

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE
Philip M. Roedel, *Director*

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By

F. E. LUX and F. E. NICHY

Special Scientific Report—Fisheries No. 622

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Number and Lengths, by Season, of Fishes Caught with an Otter Trawl near Woods Hole, Massachusetts, September 1961 to December 1962

By

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ABSTRACT

Forty-one species of fish were caught in hauls made about four times per month at water depths of 2 to 15 feet (0.6 to 4.6 m.) in Woods Hole harbor. Seasonal occurrence is discussed and compared with water temperature. Data on growth during the first year are given for a number of species.

INTRODUCTION

From September 1961 to December 1962 otter trawl hauls were made about four times monthly in shallow water in Great Harbor, near Woods Hole, Massachusetts, to obtain information on the species and sizes of fin fishes there and to collect winter flounder, *Pseudopleuronectes americanus* (Walbaum), for a food habits study. This report summarizes the results of the work, with the exception of the winter flounder food study.

The catch data provide information for certain species on occurrence in relation to season and water temperature, growth during the first year, and sizes and seasons when the young end their pelagic stage and become available to an otter trawl. The data also help to define the role of the shallow water coastal zone as a fish nursery area.

MATERIALS AND METHODS

The area sampled is shown in figure 1. The water depth where trawl hauls were made varied from 2 to 15 feet (0.6 to 4.6 m.). A small bay adjoining a salt marsh (area B in fig. 1) was not included in the sampling area until November 1961. The fishes in this shallow area included a number of euryhaline species such as sticklebacks and mummichogs that were not found in the deeper water farther from shore. Bottom sediments in the areas sampled were sand and mud.

The gear used was an otter trawl with a footrope and headrope each 30 feet (9.1 m.) long. The mesh size was 4 inches (102 mm.) in the wings and bellies and 1.5 inches (38 mm.) in the codend, stretched measure. The end 6-foot (1.8-m.) section of the codend was lined with 0.5 inch (13 mm.) mesh twine and therefore retained very small fish. The footrope was weighted with chain. The trawl was towed from a skiff powered with a 10 horsepower outboard motor and at a speed of about 1.9 miles (3.1 km.) per hour. At this speed the wingspread of the net was about 14.5 feet (4.4 m.) and the headrope height 2 feet (0.6 m.). Each tow was about 15 minutes in duration, and, usually, two tows were made per sampling date. This varied somewhat depending upon weather and net condition.

The sea surface temperatures recorded at the fishing area on each sampling date (table 1) closely coincided with those recorded daily on the opposite side of the harbor by C. H. Wheeler at the NMFS (National Marine Fisheries Service) wharf. These daily records are therefore summarized as weekly averages in

Figure 1.—Chart of Great Harbor, Woods Hole, Mass., showing the approximate trawling course (heavy line at the western side of the harbor) followed in making fish collections. Only area A was trawled in September and October 1961; areas A and B were trawled from November 1961 to December 1962.

figure 2 to provide a more complete temperature record. The water in the fishing area was isothermal, or nearly so, from surface to bottom because of vertical mixing by tidal currents and wind.

All fish caught were identified and measured at the NMFS Biological Laboratory, Woods Hole. Total lengths for fish with unforked tails and fork lengths for fish with forked tails were recorded in millimeters. Information on identification, distribution, and biology of the species caught was obtained largely from Sumner, Osborn, and Cole (1913), Nichols and Breder (1927), Hildebrand and Schroeder (1928), and Bigelow and Schroeder (1953). Scientific and common names of fishes used here are those listed by the American Fisheries Society (1960).

The catches probably provided an accurate qualitative estimate of the species and size range of fish present near the bottom. Because heavy growths of attached algae, net damage, and weather conditions frequently limited effectiveness of the trawling, however, the catches provided only approximate estimates of abundance. Forty-one species of fish were recorded, none of which were new to the area. Many additional species are of course

Table 1.—Surface water temperatures at the sampling area for each sampling date, September 1961 to December 1962.

Date	Surface temperature	Date	Surface temperature	Date	Surface temperature	Date	Surface temperature
	°C.		°C.		°C.		°C.
1961		1962		1962		1962	
Sept. 8	20.7[1]	Jan. 8	2.8	May 17	10.8	Sept. 5	19.4
Sept. 19	20.5[1]	Jan. 16	2.5	May 25	13.5	Sept. 13	19.2
Sept. 27	19.7	Feb. 1	0.0	June 4	16.7	Sept. 20	18.3
Oct. 5	19.4	Feb. 16	−0.8	June 14	16.3	Sept. 26	16.8
Oct. 10	17.9	Mar. 9	0.3	June 25	18.3	Oct. 3	16.7
Oct. 19	15.8	Mar. 20	2.5	July 3	19.2	Oct. 11	15.6
Oct. 26	13.0	Mar. 26	3.9	July 9	19.6	Oct. 18	14.7
Nov. 2	12.2	Mar. 29	4.2	July 19	19.4	Oct. 22	14.7
Nov. 13	10.3	Apr. 3	5.4	July 24	20.2	Oct. 30	11.8
Nov. 24	8.3	Apr. 9	6.7	Aug. 1	20.5	Nov. 7	10.0
Dec. 4	5.8	Apr. 19	7.2	Aug. 8	21.1	Nov. 15	8.2
Dec. 11	5.6	Apr. 26	8.0	Aug. 16	20.5	Nov. 20	7.4
Dec. 18	3.3	May 2	8.8	Aug. 22	20.8	Nov. 27	6.5
		May 11	10.0	Aug. 31	20.4	Dec. 17	2.7

[1] Recorded across the harbor at the Woods Hole Oceanographic Institution wharf.

known to occur in the Woods Hole area — particularly pelagic forms — that are unlikely to be caught in a trawl.

Most of the sampling was during daylight, usually between 0900 and 1030 hours. The only nighttime sampling was during the night of October 22-23, 1962. Although these catches indicated that species composition and abundance differed between day and night, the nighttime tows were too few to define differences. We therefore combined the night hauls with the daylight hauls for the last half of October.

NOTES ON FISHES CAUGHT

Descriptive notes for each species caught are given below. Where few individuals of a species were caught, the sizes and months caught are given in the descriptive note; for larger

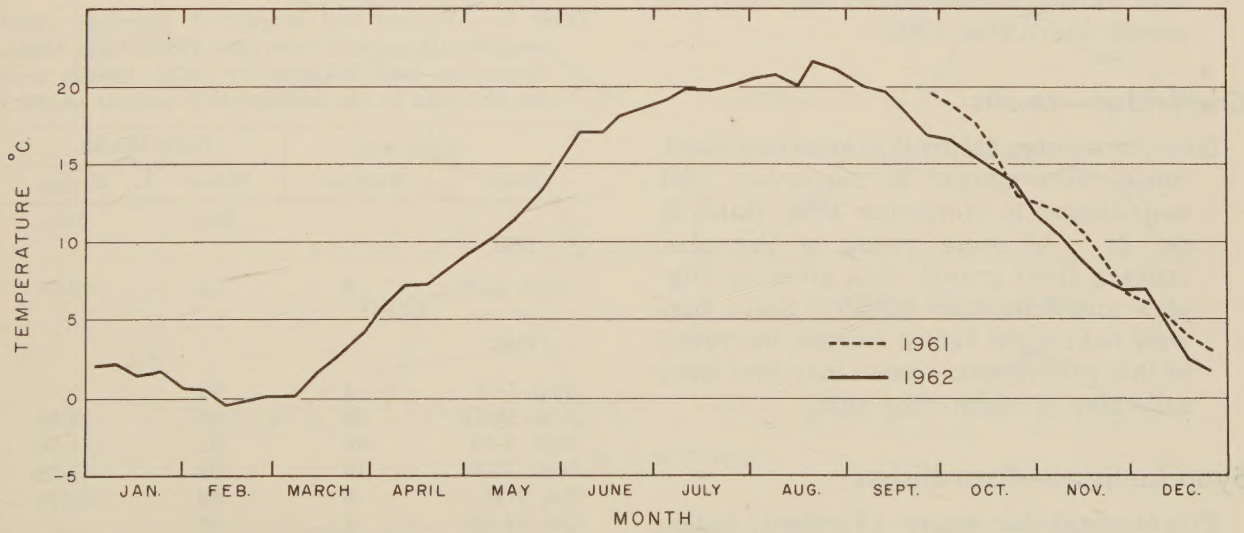

Figure 2.—Mean weekly sea surface temperature at the Bureau of Commercial Fisheries wharf at Woods Hole, Mass., September 1961 to December 1962.

catches, the average lengths and length ranges are summarized by 15-day intervals in a table. In addition, the seasonal occurrence of common species in 1962 is shown graphically in figure 3.

Carcharhinidae—requiem sharks

Mustelus canis (Mitchill), smooth dogfish. Two smooth dogfish, 384 and 396 mm. long, were caught in August 1962.

Rajidae—skates

Raja erinacea Mitchill, little skate. Eleven little skates were caught in May and June 1962. The mean length was 456 mm.; the length range, 425 to 492 mm.

Raja ocellata Mitchill, winter skate. Six winter skates were caught in October and November 1962. The mean length was 579 mm.; the length range, 440 to 664 mm.

Clupeidae—herrings

Alosa pseudoharengus (Wilson), alewife. One 0-group alewife, 78 mm. long, was caught in October 1961 and another, 68 mm. long, in November 1961.

Brevoortia tyrannus (Latrobe), Atlantic menhaden. One 0-group menhaden, 33 mm. long, was caught in August 1962.

Osmeridae—smelts

Osmerus mordax (Mitchill), American smelt. Smelt were caught in November 1961 and August to November 1962 (table 2, fig. 3). All were young of the year, judging from growth data given by Bigelow and Schroeder (1953). Since they were not caught before August, the young of this anadromous species may first enter saltwater at about that time.

Synodontidae—lizardfishes

Trachinocephalus myops (Forster), snakefish. One snakefish, 44 mm. long, was caught in August 1962 and another, 65 mm. long, in October 1962 (U.S. National Museum catalog numbers US204317 and US204321).

Anguillidae—freshwater eels

Anguilla rostrata (LeSueur), American eel. Eight American eels were caught: five juveniles and three adults. The juveniles were caught in October and November 1962 (mean length, 117 mm.; range, 91 to 129 mm.). The adults were caught in August 1962 (mean length, 665 mm.; range, 580 to 735 mm.).

Cyprinodontidae—killifishes

Fundulus heteroclitus (Linnaeus), mummichog. Three mummichogs were caught in 1962, two in January (34 and 61 mm. long) and one in September (110 mm. long). This species is common in summer in shallow pools of the adjacent salt marsh, but it was scarce in all seasons in the area trawled.

Fundulus majalis (Walbaum), striped killifish. Five striped killifish were caught in November 1961 and March, April, and November 1962. The mean length was 60

Table 2.—Numbers and lengths of American smelt caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Smelt were caught only in the semimonthly periods shown.)

Date	Number	Fork length	
		Mean	Range
		Mm.	*Mm.*
1961			
Nov. 15-30	2	56	56-57
1962			
Aug. 1-15	1	61	--
Aug. 16-31	36	63	48-69
Sept. 1-15	96	61	51-76
Sept. 16-30	14	63	47-72
Oct. 1-15	9	68	62-79
Oct. 16-31	1	62	--
Nov. 1-15	2	105	82-128
Nov. 16-30	2	78	77-79

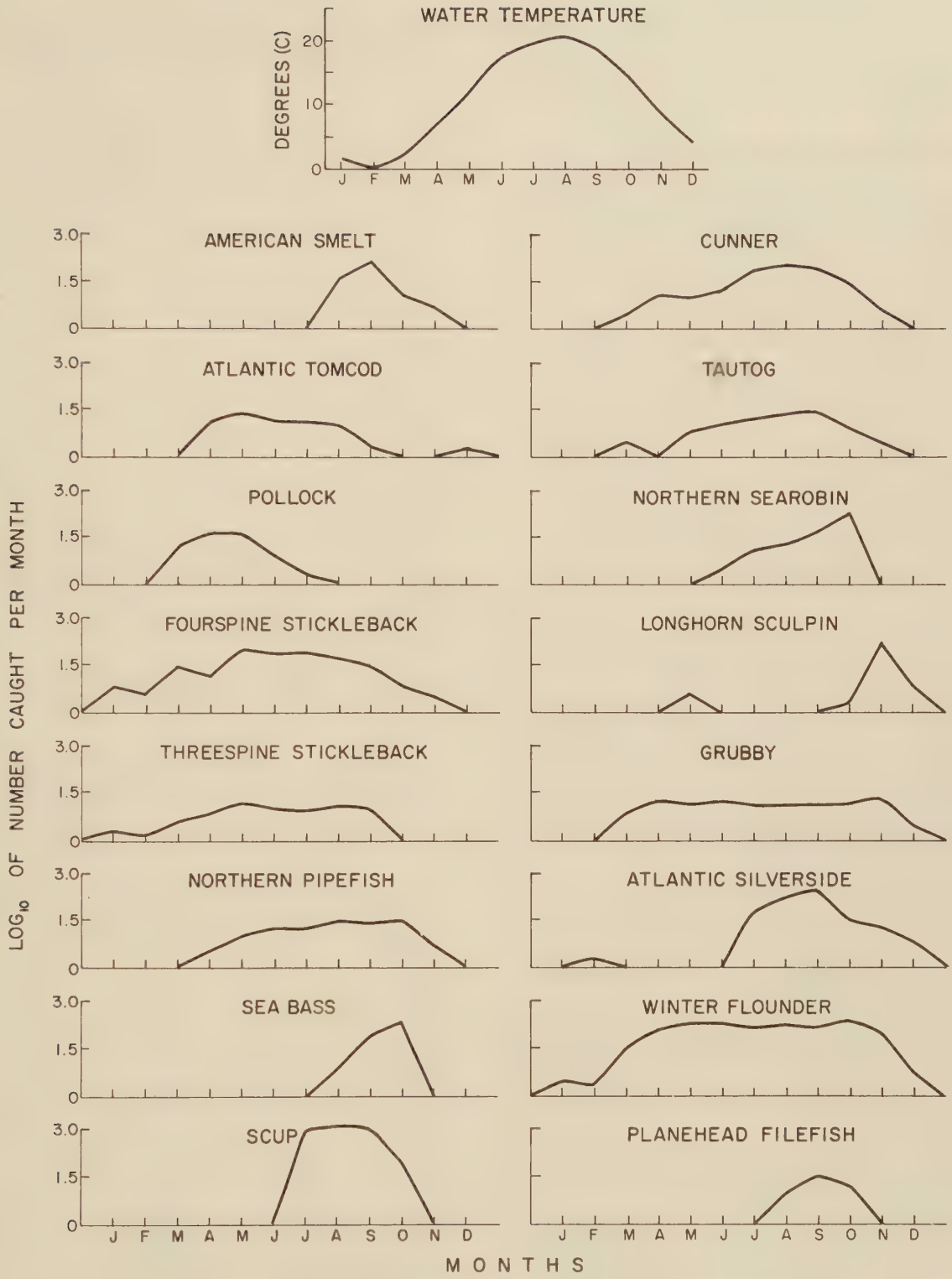

Figure 3.—Seasonal occurrence of common fish species in otter trawl catches at Woods Hole, Mass., in 1962, expressed as $\log_{10}$ of the number caught per month, and monthly average sea surface temperature in 1962.

mm.; the length range, 42 to 110 mm. This species also lives in the salt marsh in the summer, although it is less common than the mummichog.

Gadidae—codfishes and hakes

Merluccius bilinearis (Mitchill), silver hake.

One silver hake, 80 mm. long, was caught in late November 1962.

Microgadus tomcod (Walbaum), Atlantic tomcod.

Tomcod were most common from spring to late summer (table 3, fig. 3). Young of the year fish 27 to 47 mm. long were first caught in April; by August, fish of what we assumed to be this same age group were 80 to 122 mm. long.

Pollachius virens (Linnaeus), pollock.

All pollock caught were 0-group fish, according to growth data given by Bigelow and Schroeder (1953) (table 4, fig. 3). Their average length was 30 mm. in late March (when they first appeared in the catch) and 52 mm. in early June (when they became scarce). These fish may have left the area because of rising water temperature.

Urophycis chuss (Walbaum), red hake.

Ten red hake were caught in September to November 1962. The eight of these that were caught in October and November (mean length, 104 mm.; range, 68 to 136 mm.) probably were young of the year, since this species spawns in spring and summer; however, age was not determined. Seven of these eight were caught in the night tows of October 22-23. The two fish caught in September (262 and 263 mm. long) apparently were of an older age group.

Urophycis tenuis (Mitchill), white hake.

Sixteen white hake, 41 to 171 mm. long, were caught in May to July 1962 (table 5). We judged that these were 0-group fish which were spawned during the previous winter, for Marak, Colton, Foster, and Miller (1962) found small white hake 27 to 68 mm. long still planktonic in the Gulf of Maine in May and June.

Table 3.—Numbers and lengths of Atlantic tomcod caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Tomcod were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Nov. 1-15	2	110	100-120	--	--	--
1962						
Apr. 1-15	6	42	33-47	--	--	--
Apr. 16-30	6	34	27-39	--	--	--
May 1-15	10	41	32-56	--	--	--
May 16-31	13	39	29-55	2	193	192-194
June 1-15	6	45	32-50	1	150	--
June 16-30	3	70	64-75	1	158	--
July 1-15	5	66	58-73	2	164	155-173
July 16-31	3	89	66-101	2	205	160-250
Aug. 1-15	3	96	80-106	1	198	--
Aug. 16-31	2	110	98-122	2	181	157-216
Sept. 1-15	--	--	--	1	217	--
Dec. 16-31	1	155	--	--	--	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953).

Table 4.—Numbers and lengths of pollock caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Pollock were caught only in the semimonthly periods shown.)

Date	Number	Fork length	
		Mean	Range
		Mm.	*Mm.*
1962			
Mar. 16-31	14	30	25-37
Apr. 1-15	25	31	23-39
Apr. 16-30	19	37	29-47
May 1-15	9	42	25-57
May 16-31	28	45	25-67
June 1-15	6	52	32-63
July 16-31	1	89	--

Gasterosteidae—sticklebacks

Apeltes quadracus (Mitchill), fourspine stickleback.

The fourspine stickleback was one of the few species caught in all months of the year (table 6, fig. 3). Most were caught

in water 2 to 4 feet (0.6 to 1.2 m.) deep near the adjacent salt marsh. A few of the smallest fish, 14 to 30 mm. long, taken in the late summer probably were spawned in early summer. The larger fish probably were adults, for the maximum length of this species is about 60 mm. (Bigelow and Schroeder, 1953).

Table 5.—Numbers and lengths of white hake caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (White hake were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1962			
May 16-31	6	76	55-128
June 1-15	5	75	41-100
June 16-30	1	75	--
July 1-15	3	102	84-134
July 16-31	1	171	--

Table 6.—Numbers and lengths of fourspine sticklebacks caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Fourspine sticklebacks were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1961			
Nov. 1-15	8	39	33-44
Nov. 16-30	4	41	34-49
Dec. 1-15	4	44	37-47
1962			
Jan. 1-15	2	40	38-43
Jan. 16-31	3	41	34-46
Feb. 1-14	3	40	36-43
Mar. 1-15	1	29	--
Mar. 16-31	23	37	32-48
Apr. 1-15	6	42	34-46
Apr. 16-30	5	39	32-50
May 1-15	14	41	30-49
May 16-31	82	40	31-51
June 1-15	38	41	33-49
June 16-30	26	42	34-52
July 1-15	49	40	16-50
July 16-31	27	36	14-48
Aug. 1-15	12	42	35-54
Aug. 16-31	41	39	25-57
Sept. 1-15	22	39	30-48
Sept. 16-30	12	39	31-50
Oct. 1-15	2	32	30-35
Oct. 16-31	3	40	38-42
Nov. 1-15	1	41	--
Nov. 16-30	1	46	--

Gasterosteus aculeatus Linnaeus, threespine stickleback.

The threespine stickleback (table 7, fig. 3) also was caught in shallow water near the salt marsh. This species apparently spawns in early summer in brackish to fresh water (Bigelow and Schroeder, 1953); therefore, we assumed that the small individuals 19 to 38 mm. long taken in late June through September were 0-group fish.

Pungitius pungitius (Linnaeus), ninespine stickleback.

One ninespine stickleback, 35 mm. long, was caught in August 1962.

Table 7.—Numbers and lengths of threespine sticklebacks caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Threespine sticklebacks were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Fork length			Fork length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Nov. 1-15	--	--	--	1	43	--
1962						
Jan. 1-15	--	--	--	1	47	--
Mar. 16-31	--	--	--	3	48	42-62
Apr. 1-15	--	--	--	1	43	--
Apr. 16-30	--	--	--	4	54	47-59
May 1-15	--	--	--	10	55	50-61
May 16-31	--	--	--	5	53	50-59
June 1-15	--	--	--	5	53	48-56
June 16-30	1	28	--	2	58	55-61
July 1-15	1	22	--	3	54	50-57
July 16-31	1	19	--	2	58	56-59
Aug. 1-15	3	31	29-34	--	--	--
Aug. 16-31	8	29	24-35	--	--	--
Sept. 1-15	6	31	27-35	--	--	--
Sept. 16-30	4	32	29-38	--	--	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953).

Syngnathidae—pipefishes and seahorses

Syngnathus fuscus Storer, northern pipefish.

Pipefish were caught from late April through November, but none were taken during the winter or early spring (table 8, fig. 3). Growth information from Bigelow and Schroeder (1953) indicates that the small individuals 61 to 141 mm. long caught in late July and August, and most of the specimens after August, were 0-group fish.

Table 8.—Numbers and lengths of northern pipefish caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Pipefish were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1962						
Apr. 16-30	--	--	--	2	171	165-177
May 1-15	--	--	--	4	154	145-165
May 16-31	--	--	--	5	178	167-192
June 1-15	--	--	--	11	161	118-204
June 16-30	--	--	--	3	148	120-167
July 1-15	--	--	--	4	164	140-193
July 16-31	5	79	72-84	6	179	158-214
Aug. 1-15	3	81	61-95	1	170	--
Aug. 16-31	24	120	86-141	4	183	170-207
Sept. 1-15	6	148	138-154	--	--	--
Sept. 16-30	16	141	109-168	--	--	--
Oct. 1-15	15	144	121-176	--	--	--
Oct. 16-31	17	156	135-192	--	--	--
Nov. 1-15	2	186	171-201	--	--	--
Nov. 16-30	2	160	155-165	--	--	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953) and by the seasonal progression of length frequency distributions in the 1961-62 fish.

Serranidae—sea basses

Centropristes striatus (Linnaeus), black sea bass.

The only sea bass caught were 0-group fish (table 9, fig. 3). They were first caught in August and were present until November. These small fish left the area abruptly in the autumn after the water temperature had fallen below 14° C. (tables 1, 9).

Priacanthidae—bigeyes

Pristigenys alta (Gill), short bigeye.

The only short bigeyes caught were two taken during the night of October 22-23, 1962, the only time night tows were made. One was 85 mm. long; the other, slightly smaller but not measured.

Sciaenidae—drums

Menticirrhus saxatilis (Bloch and Schneider), northern kingfish.

Twelve northern kingfish (mean length, 143 mm.; range, 78 to 178 mm.) were caught in September 1961 and in September and October 1962. Eight of the 12 were caught during the night tows of October 22-23, 1962, suggesting that catchability or availability was greater at night than during the day. Growth information from Schaefer (1965) indicates that all 12 specimens were 0-group fish.

Mullidae—goatfishes

Mullus auratus Jordan and Gilbert, red goatfish.

One red goatfish, 62 mm. long, was caught in late August; another, 80 mm. long, in early September, 1962.

Table 9.—Numbers and lengths of black sea bass caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Sea bass were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1961			
Sept. 1-15	66	41	33-51
Sept. 16-30	87	44	32-56
Oct. 1-15	57	46	37-67
Oct. 16-31	28	44	35-53
Nov. 1-15	2	50	45-56
1962			
Aug. 1-15	1	33	--
Aug. 16-31	5	42	35-52
Sept. 1-15	20	45	31-63
Sept. 16-30	58	48	32-67
Oct. 1-15	55	46	33-66
Oct. 16-31	130	41	27-60

Sparidae—porgies

Stenotomus chrysops (Linnaeus), scup.

Small scup were caught in September and October 1961 and in July to October 1962 (table 10, fig. 3). We judged that all were 0-group fish on the basis of growth data given by Bigelow and Schroeder (1953) and Finkelstein (1969). The appearance of fish 15 to 30 mm. long in early July 1962 indicated that some of the young ended pelagic life at about that size. The fish caught in 1962 were progressively longer from early July to early October. There was no apparent length increase after early October.

Table 10.—Numbers and lengths of scup caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Scup were caught only in the semimonthly periods shown.)

Date	Number	Fork length	
		Mean	Range
		Mm.	*Mm.*
1961			
Sept. 1-15	860	48	32-77
Sept. 16-30	1,011	56	36-91
Oct. 1-15	777	64	41-95
Oct. 16-31	47	66	44-87
1962			
July 1-15	121	24	17-30
July 16-31	737	30	21-44
Aug. 1-15	210	41	27-61
Aug. 16-31	1,067	54	30-81
Sept. 1-15	734	61	38-86
Sept. 16-30	350	70	51-93
Oct. 1-15	47	82	53-95
Oct. 16-31	39	75	45-97

The scup left the Woods Hole area abruptly in the autumn, and their departure coincided with sharp drops in water temperature. For example, for approximately equal amounts of trawling the following numbers of scup were caught on successive trawling dates in October 1961: October 4, 354 fish; October 12, 423; October 19, 47; October 26, 0. In this period the water temperature dropped from 19.4 to 13.0° C. (table 1, fig. 2). Scup were less numerous in 1962, but the pattern of autumn departure in relation to temperature was similar to that in 1961 (fig. 3).

Labridae—wrasses

Tautogolabrus adspersus (Walbaum), cunner.

Cunners were caught from September to early December in 1961 and from late March through November in 1962 (table 11, fig. 3). They were rare or absent during the coldest months. This species spawns in spring and early summer (Bigelow and Schroeder, 1953), and the fish 30 to 59 mm. long in 1961 were judged

Table 11.—Numbers and lengths of cunners caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Cunners were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Sept. 1-15	3	31	30-32	--	--	--
Sept. 16-30	5	35	31-43	1	72	--
Oct. 1-15	5	39	35-42	--	--	--
Oct. 16-31	8	42	33-54	--	--	--
Nov. 1-15	10	42	33-52	1	78	--
Nov. 16-30	6	49	41-59	--	--	--
Dec. 1-15	--	--	--	1	76	--
1962						
Mar. 16-31	--	--	--	2	36	35-38
Apr. 1-15	--	--	--	5	39	33-49
Apr. 16-30	--	--	--	6	46	37-59
May 1-15	--	--	--	4	44	39-50
May 16-31	--	--	--	6	47	36-59
June 1-15	--	--	--	7	65	50-75
June 16-30	--	--	--	7	61	55-71
July 1-15	7	21	17-27	11	91	52-151
July 16-31	24	24	15-37	32	94	57-176
Aug. 1-15	34	33	21-46	22	87	60-155
Aug. 16-31	20	39	26-54	31	101	66-201
Sept. 1-15	39	42	28-59	25	92	63-150
Sept. 16-30	18	50	36-62	6	75	67-85
Oct. 1-15	7	43	34-56	2	83	77-90
Oct. 16-31	17	48	39-62	3	87	82-95
Nov. 1-15	1	59	--	--	--	--
Nov. 16-30	2	54	53-55	--	--	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953) and by the seasonal progression of length frequency distributions in the 1961-62 fish.

to be young of the year. In 1962, the 0-group fish appeared in catches in early July at lengths of 17 to 27 mm. and were present through November. Cunners caught from late March through June in 1962 probably were 1-group fish; however, from July to early September fish older than 1-group also appeared to be present (table 11).

Tautoga onitis (Linnaeus), tautog.

Tautog, 26 to 375 mm. long, were caught in September to early December 1961 and in late March to early November 1962 (table 12, fig. 3). This species spawns chiefly in June in the Woods Hole area (Bigelow and Schroeder, 1953), and the fish 41 to 74 mm. long in 1961 were judged to be young of the year on the basis of growth data for age-group 1 and older given by Cooper (1967). In 1962, specimens 26 to 43 mm. long began appearing in catches in August and were present until early November. These small fish apparently also were of age-group 0.

Gobiidae—gobies

Gobiosoma ginsburgi Hildebrand and Schroeder, seaboard goby.

Four seaboard gobies were caught: one each in November and December 1961 and two in October 1962. The lengths were 39, 41, 44, and 45 mm. (U.S. National Museum catalog numbers for the last three: US204319, US204320, US204322).

This species has not been previously reported for the Woods Hole area. It was not described as a species separate from the naked goby (*G. bosci*) until 1928 (Hildebrand and Schroeder, 1928), however, and since the naked goby has been mentioned as common in the summer near Woods Hole (Sumner, et al., 1913) it seems likely that seaboard gobies were caught there also in the past and identified as naked gobies.

Triglidae—searobins

Prionotus carolinus (Linnaeus), northern searobin.

Table 12.—Numbers and lengths of tautog caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Tautog were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Sept. 1-15	2	57	52-62	--	--	--
Sept. 16-30	7	56	50-66	--	--	--
Oct. 1-15	4	60	56-74	1	90	--
Oct. 16-31	2	42	41-42	--	--	--
Nov. 1-15	2	46	41-50	--	--	--
Nov. 16-30	1	44	--	--	--	--
Dec. 1-15	2	50	42-57	--	--	--
1962						
Mar. 16-31	--	--	--	2	48	42-53
May 16-31	--	--	--	2	167	61-273
June 1-15	--	--	--	4	147	64-365
June 16-30	--	--	--	2	85	75-95
July 1-15	--	--	--	8	108	65-190
July 16-31	--	--	--	9	139	88-265
Aug. 1-15	2	34	26-43	7	132	86-163
Aug. 16-31	4	46	35-58	10	112	93-153
Sept. 1-15	2	46	41-51	18	160	88-353
Sept. 16-30	2	56	46-65	6	134	98-211
Oct. 1-15	--	--	--	4	178	100-375
Oct. 16-31	2	69	68-70	1	178	--
Nov. 1-15	1	33	--	--	--	--
Nov. 16-30	--	--	--	1	96	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953), Cooper (1967), and by the seasonal progression of length frequency distributions in the 1961-62 fish.

Searobins were caught from September through November in 1961 and from late July through October in 1962 (table 13, fig. 3). All were 0-group fish except for a few larger individuals in catches during the summer of 1962. The young fish first appeared in July and early August at lengths of 33 to 42 mm. This may approximate the size when the pelagic phase ends. These young fish had reached an average length of 68 mm. by the end of October.

The searobins disappeared from catches in October and November. They apparently left the area in response to the rapid

Table 13.—Numbers and lengths of northern sea robins caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Sea robins were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Fork length			Fork length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Sept. 1-15	2	48	38-58	--	--	--
Sept. 16-30	6	59	43-75	--	--	--
Oct. 1-15	9	65	56-77	--	--	--
Oct. 16-31	12	67	55-79	--	--	--
Nov. 1-15	5	64	59-72	1	--	--
Nov. 16-30	2	73	71-75	--	--	--
1962						
June 16-30	--	--	--	2	256	253-260
July 1-15	--	--	--	9	230	196-275
July 16-31	1	35	--	1	212	--
Aug. 1-15	4	37	33-42	3	231	220-253
Aug. 16-31	10	51	44-61	--	--	--
Sept. 1-15	16	55	44-67	2	256	255-256
Sept. 16-30	27	60	52-75	--	--	--
Oct. 1-15	27	68	52-80	--	--	--
Oct. 16-31	166	68	34-94	--	--	--

1 Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953) and by the seasonal progression of length frequency distributions in the 1961-62 fish.

drop in water temperature that was occurring at this time (table 1, fig. 2).

Cottidae—sculpins

Myoxocephalus octodecemspinosus (Mitchill), longhorn sculpin.

Longhorn sculpins were caught in October to December 1961 and in May and October to December 1962 (table 14, fig. 3). While no measurements were obtained for the 1961 fish, they were similar in size to those from 1962. All of the fish were assumed to be adults. The increase in numbers in November apparently was related to spawning, which occurs in inshore areas at about this time (Bigelow and Schroeder, 1953).

Myoxocephalus aeneus (Mitchill), grubby.

Grubbies were caught in November and December 1961 and in late March to December 1962 (table 15, fig. 3). Small specimens about 35 to 50 mm. long, which appeared in late March and were present through the rest of the year as progressively larger fish, probably were of a single age-group of this species which spawns in autumn and winter. These may have been 0-group fish, because no smaller specimens were caught; Bigelow and Schroeder (1953) reported that the young of this species are planktonic in the Woods Hole area during late winter and spring.

Dactylopteridae—flying gurnards

Dactylopterus volitans (Linnaeus), flying gurnard.

A single flying gurnard, 69 mm. long, was caught in August 1962 (U.S. National Museum catalog number US204318).

Pholidae—gunnels

Pholis gunnellus (Linnaeus), rock gunnel.

Seventeen rock gunnels were caught (table 16). A few of these — in particular one 72 mm. long taken in late November 1961 and one 55 mm. long in early August 1962

Table 14.—Numbers and lengths of longhorn sculpins caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Longhorn sculpins were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1961			
Oct. 16-31	1	--	--
Nov. 1-15	35	--	--
Nov. 16-30	29	--	--
Dec. 1-15	23	--	--
Dec. 16-31	1	--	--
1962			
May 1-15	2	324	322-327
May 16-31	1	305	--
Oct. 16-31	1	290	--
Nov. 1-15	55	289	232-335
Nov. 16-30	87	288	248-350
Dec. 16-31	6	291	280-305

Table 15.—Numbers and lengths of grubbies caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Grubbies were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1961			
Nov. 1-15	12	82	53-100
Nov. 16-30	13	81	59-95
Dec. 1-15	30	83	57-122
Dec. 16-31	2	80	85-95
1962			
Mar. 16-31	6	62	38-107
Apr. 1-15	16	49	35-68
Apr. 16-30	2	76	62-90
May 1-15	6	51	48-55
May 16-31	6	55	50-60
June 1-15	3	69	61-84
June 16-30	15	81	60-135
July 1-15	5	72	62-80
July 16-31	5	83	69-119
Aug. 1-15	3	76	71-79
Aug. 16-31	9	81	69-95
Sept. 1-15	7	80	75-104
Sept. 16-30	4	89	82-94
Oct. 1-15	2	92	91-92
Oct. 16-31	11	93	62-122
Nov. 1-15	14	100	92-110
Nov. 16-30	6	102	94-116
Dec. 16-31	2	100	91-108

Table 16.—Numbers and lengths of rock gunnels caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Rock gunnels were caught only in the semimonthly periods shown.)

Date	Number	Total length	
		Mean	Range
		Mm.	*Mm.*
1961			
Oct. 16-31	1	91	--
Nov. 16-30	1	72	--
1962			
Apr. 1-15	1	94	--
Apr. 16-30	2	108	78-139
May 1-15	2	100	91-108
May 16-31	6	97	80-112
June 1-15	1	115	--
Aug. 1-15	1	55	--
Oct. 16-31	1	103	--
Nov. 16-30	1	88	--

— may have been young from spawning of the previous winters, on the basis of growth information for the European form summarized by Bigelow and Schroeder (1953).

Stromateidae—butterfishes

Poronotus triacanthus (Peck), butterfish.

Butterfish were caught only in 1962 during three summer months: 12 fish in early July (mean length, 39 mm.; range, 35 to 43 mm.); 2 in August (mean length, 42 mm.; range, 41 to 44 mm.); and 13 in early September (mean length, 51 mm.; range, 42 to 64 mm.). We judged all to be 0-group fish on the basis of growth data reported by Bigelow and Schroeder (1953).

Atherinidae—silversides

Menidia menidia (Linnaeus), Atlantic silverside.

Silversides were caught in some numbers in October to December 1961 and July to December 1962; also, a single specimen was taken in February 1962 (table 17, fig. 3). The small individuals 13 to 26 mm. long that began to appear in July clearly were 0-group fish (Bigelow and Schroeder, 1953). This age-group apparently was the only one sampled from summer on in 1962. A measure of average growth for this group may be obtained by following the progression of mean lengths from 18 mm. in July to 80 mm. in December.

Bothidae—lefteye flounders

Paralichthys dentatus (Linnaeus), summer flounder.

Sixty summer flounders were caught in October 1961 and in May to October 1962. The mean length of 16 that were measured was 420 mm. and the length range 340 to 520 mm. The others were not measured, but their length distribution was about the same as that of the measured ones. No young fish, less than 300 mm. long, were caught.

Table 17.—Numbers and lengths of Atlantic silversides caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Silversides were caught only in the semimonthly periods shown.)

Date	Number	Fork length	
		Mean	Range
		Mm.	*Mm.*
1961			
Oct. 1-15	1	68	--
Oct. 16-31	8	72	60-85
Nov. 1-15	29	78	63-112
Nov. 16-30	115	75	55-106
Dec. 1-15	206	70	54-97
Dec. 16-31	11	76	61-86
1962			
Feb. 1-14	1	66	--
July 1-15	18	18	13-26
July 16-31	44	29	18-39
Aug. 1-15	4	39	36-46
Aug. 16-31	152	56	44-79
Sept. 1-15	270	56	44-75
Sept. 16-30	4	62	55-71
Oct. 1-15	19	67	57-81
Oct. 16-31	9	71	63-79
Nov. 1-15	4	71	65-80
Nov. 16-30	14	74	63-98
Dec. 16-31	6	80	72-88

Scophthalmus aquosus (Mitchill), windowpane.

A single windowpane (sand flounder), 53 mm. long, was caught in mid-May 1962. The size indicated that it was a 0-group fish from spring spawning (Bigelow and Schroeder, 1953).

Pleuronectidae—righteye flounders

Pseudopleuronectes americanus (Walbaum), winter flounder.

Winter flounders were caught in all months from September 1961 to December 1962, although they were scarce during the winter (table 18, fig. 3). Young of the year fish did not appear in catches until November 1961, when trawling in the shallow water near the salt marsh (fig. 1) was first begun. In 1962 the 0-group fish were 17 to 32 mm. long when they first were caught in early June. They probably descend to the bottom at about this length, for we have caught planktonic stages as long as 17 mm. in May in this area.

The growth of 0-group fish may be traced by following the progression of mean lengths in 1962 (table 18). They grew to a length of about 73 mm. by late fall. In 1961 the 0-group winter flounders were about 87 mm. long in late fall, suggesting

Table 18.—Numbers and lengths of winter flounder caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Winter flounder were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Sept. 1-15	--	--	--	38	286	157-354
Sept. 16-30	--	--	--	91	287	144-383
Oct. 1-15	--	--	--	50	296	117-371
Oct. 16-31	--	--	--	99	301	170-404
Nov. 1-15	31	87	61-125	93	276	101-367
Nov. 16-30	33	89	64-125	39	273	142-397
Dec. 1-15	92	87	60-134	36	238	136-360
Dec. 16-31	1	96	--	--	--	--
1962						
Jan. 1-15	--	--	--	2	322	298-347
Feb. 15-28	--	--	--	1	307	--
Mar. 16-31	--	--	--	28	215	64-409
Apr. 1-15	--	--	--	76	186	55-381
Apr. 16-30	--	--	--	71	196	58-417
May 1-15	--	--	--	66	138	78-360
May 16-31	--	--	--	119	198	72-394
June 1-15	39	23	17-32	92	260	82-390
June 16-30	17	32	21-43	44	228	100-370
July 1-15	5	39	31-44	56	282	118-377
July 16-31	2	42	34-51	56	296	116-410
Aug. 1-15	5	40	22-58	61	268	137-374
Aug. 16-31	9	53	26-64	93	272	97-361
Sept. 1-15	2	60	56-64	43	275	140-386
Sept. 16-30	11	61	39-87	54	278	122-411
Oct. 1-15	12	71	52-85	58	272	135-422
Oct. 16-31	36	72	55-102	180	278	127-390
Nov. 1-15	19	73	50-95	28	291	123-381
Nov. 16-30	19	73	46-105	26	262	132-311
Dec. 16-31	3	67	47-90	1	363	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953) and from examination of length frequency distributions and otoliths in the 1961-62 fish.

that there may have been differences in rate of growth or development in the 2 years.

Large winter flounders (about 250 mm. and over) began maturing in early fall, and they gradually disappeared from catches in late fall as maturation progressed. Presumably they moved to estuaries, where much of the spawning takes place (Bigelow and Schroeder, 1953). No spawning fish were observed in the Woods Hole harbor catches.

Balistidae—triggerfishes and filefishes

Monacanthus hispidus (Linnaeus), planehead filefishes.

Planehead filefish were recorded in November 1961 and in August through October 1962 (table 19, fig. 3). We judged that most of these fish were young of the year.

Table 19.—Numbers and lengths of planehead filefish caught with an otter trawl near Woods Hole, Mass., September 1961 to December 1962. (Filefish were caught only in the semimonthly periods shown.)

Date	Young of the year[1]			Age group 1 and older		
	Total length			Total length		
	Number	Mean	Range	Number	Mean	Range
		Mm.	*Mm.*		*Mm.*	*Mm.*
1961						
Nov. 1-15	1	30	--	--	--	--
1962						
Aug. 1-15	2	33	26-41	--	--	--
Aug. 16-31	6	58	29-86	--	--	--
Sept. 1-15	13	65	36-88	12	131	109-212
Sept. 16-30	9	68	34-94	--	--	--
Oct. 1-15	5	63	24-84	--	--	--
Oct. 16-31	10	63	46-81	--	--	--

[1] Assumed to be young of the year on the basis of data given by Bigelow and Schroeder (1953).

Tetraodontidae—puffers

Sphaeroides maculatus (Bloch and Schneider), northern puffer.

Eleven puffers were caught from mid-July to early October 1962. These were divided into two size groups: four were large fish (mean length, 192 mm.; range, 167 to 213 mm.) and seven were small (mean length, 42 mm.; range, 15 to 64 mm.). We judged the latter to be 0-group fish on the basis of growth data from Bigelow and Schroeder (1953).

Lophiidae—goosefishes

Lophius americanus Valenciennes, goosefish. One goosefish, 833 mm. long, was caught in October 1962; another, 902 mm. long, was taken in November 1962.

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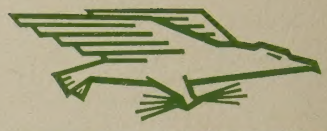

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